INSTRUCTION BULLETIN

MT-14103-L5B TEST SET

CATALOG NO. 99-0143

OLD ONE

MetroTel Corp.

15 Burke Lane
Syosset, N.Y. 11791
(516) 364-3377

56-0014

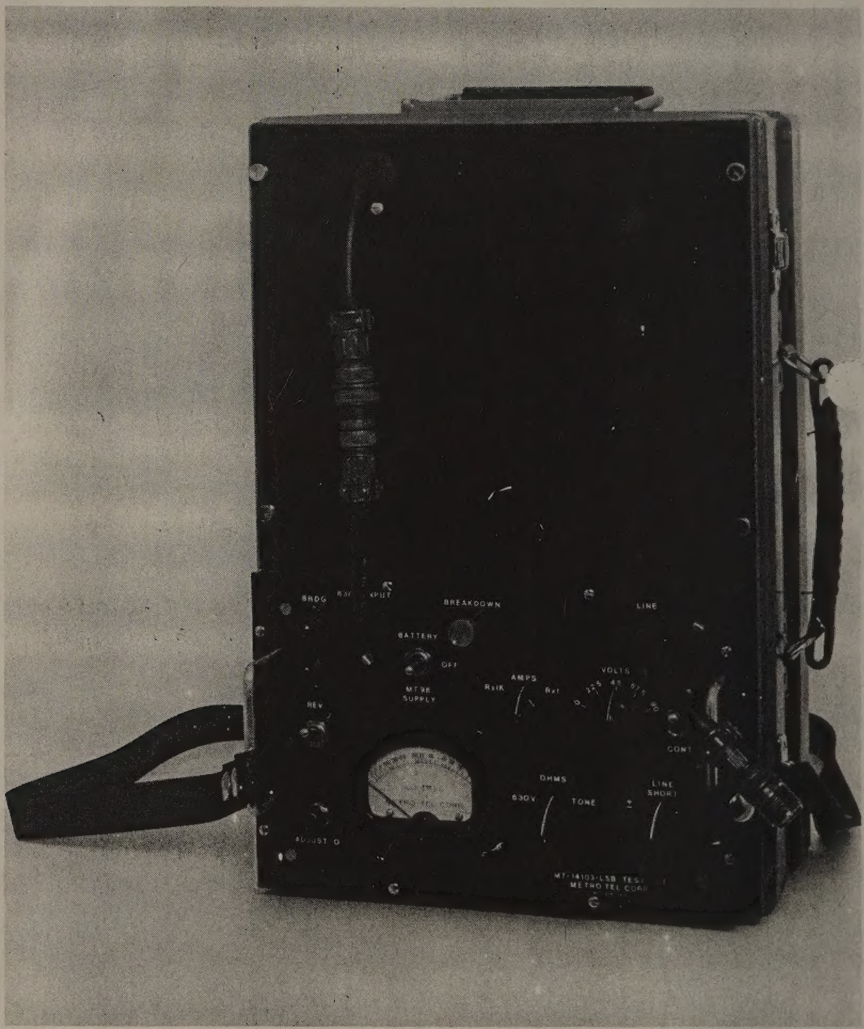


Fig. 1—MT-14103 List 5B Test Set
(99-0143)

MT-14103-L5B

(99-0143)

CABLE BREAKDOWN TEST SET

INTRODUCTION — GENERAL

The MT-14103-L5B Test Set is intended for use in locating high resistance faults resulting from moisture in exchange cables. The test set is used as a tone source for fault location and employs a 500-cycle solid state tone to take full advantage of the characteristics of the amplifiers with which it is used (generally, the Metro Tel MT 147C or the WECO 147B amplifiers).

The primary use of the set is to reduce the fault resistance between the defective wires to permit running down the fault with tone and an exploring coil. Most faults can be broken down as a short on one pair and the set should, if possible, be used on this basis. If the fault can not be broken down as a short, the set can then be used to break down the fault as a cross between two pairs.

The MT-14103-L5B Test Set *must not* be connected between one side of a pair and ground.

The MT-14103-L5B Test Set can be used to advantage in cases where the entire cable is out of service or where a Wheatstone bridge location can not be made.

DESCRIPTION

The MT-14103-L5B Breakdown Set is composed of a battery pack and a control unit which may be removed from the battery pack. This two piece construction enables; the repairman to breakdown the cable from the ground or a pole when working with aerial cable. The MT-14103-L5B is housed in a portable metal case.

POWER REQUIREMENT* (Not Furnished With Set)

QTY.	VOLTAGE	TYPES
15	45 Volts	Eveready #738
1	1½ Volts	Eveready #711

*Optional MT-98 A.C. Power Supply, may be used in place of batteries.

The Control Unit contains a number of switches which when oriented correctly will apply 630 volts across the defective wires. It provides a 630V cut-off switch in series with the batteries and also

provides a switch for reversing the polarity of the breakdown voltage, a solid state tone source for use with an exploring coil, a switch making the tone continuous or intermittant. A meter is provided for reading the current through the fault, checking the resistance of the faulty cable pair before and after the trouble is broken down and for testing the batteries in the set. It has a built in battery supply for the tone and meter circuits which enables the control unit to be disconnected from the battery pack and left on the pole while tracing the fault. The control unit is housed in a highly insulated plastic case.

The voltage of the tone circuit can be varied in steps from 22.5 to 90 volts by means of the selector switch.

The OHMS switch will be part of the breakdown voltage circuit when set in the 630V position. When operated in the TONE position, tone is applied to the defective pair after the fault has been broken down. The switch must be in the center position when the ohmmeter circuit is used.

The LINE SHORT switch is a three-position battery reversing switch which in the mid-position places a 4700 OHM resistor across the pair. The left and right positions are used to reverse the test set connections to the LINE receptacle. When making a breakdown test these positions are used to reverse the polarity of the battery being applied to the line.

The AMPS switch (non-locking) controls the meter circuit. When this switch is in the R x 1 position the resistance across the pair can be read directly from the upper scale (0-2000 OHMS) of the meter; with the key in the RX1000 position the resistance across the pair is 1000 times the reading on the upper scale (0-2 MEGOHMS) of the meter. With the key in the mid-position, the current flow from the breakdown battery can be read directly on the lower scale (0-5 amperes) of the meter.

A number of line cords are provided with the unit.

1. A 30 ft. cable which connects the power packs with the control unit.
2. A 30 ft. cable which connects the control unit to the line.
3. A 6 ft. cable which can also be used to connect the control unit to the line.
4. A small battery testing cable is provided for testing the individual 45 volt batteries of the battery pack.

The cords enable the repairman to operate the control unit from the ground or on a pole.

The red momentary contact breakdown push button switch is used to apply breakdown voltage to the line after all the other switches are in position.

The ADJUST O knob is used for adjusting the ohmeter. With the line cord clips short-circuited and the AMPS key in the RX1000 or the R x 1 position turn the knob until the ohmeter reads zero.

A folding handle is provided at the rear of the box to permit hanging the set on a pole step.

Auxiliary battery for Wheatstone bridge measurements can be obtained from the BRDG-BAT binding posts on the set. This voltage is controlled by the selector switch, in steps from 22.5 to 90. The REV switch can be used as a battery reversing switch when the bridge is being employed for locating opens.

A power selector switch is provided for selection of power from the battery pack or from an external supply such as the Model MT 98 power supply. This power supply which operates from 120V AC can be used when AC power is available. Using this supply whenever possible will cut down battery consumption and also will provide a more efficient source of breakdown power.

MAINTENANCE

Batteries: The 45 volt batteries in the set should be tested about twice a month and at any other time when their condition is doubtful. This test is made by short-circuiting the six foot cable test leads and inserting the plug into the line receptable. Connect the Battery Pack to the Control Unit. Put the power selector switch on DC BAT, the cut-off switch on 630V, the OHMS switch on 630V, the LINE SHORT switch to ± and momentarily depress the red push-button. If the current flow is less than from 1½ to 2 amperes and the batteries have given reasonable service, they should be discarded. If they have been in use only a short time and there is reason to suspect that only a few of the batteries are depleted, they should be tested individually as described below.

To test the individual 45 volt battery, disconnect 630V input connector from battery pack. Connect short battery test cable to 630V input connector and insert plug into battery to be tested. Short line cable alligator clips together. Place Power Select switch to MT-98

position, LINE SHORT switch to ± and OHMS switch to 630V position. Momentarily depress breakdown switch (Red Button). If current flow is less than 1½ amperes battery should be replaced.

CONNECTING SET TO CONDUCTORS

The general location of the fault should be determined by analysis of the pair count affected. The resistance between wires can be measured using the meter in the test set.

The breakdown set should be applied as near to the fault as practicable, if its general location can be determined.

The pair or pairs having the lowest fault resistance (as a short) should be used for the test, if possible. If the fault can not be broken down using individual pairs, the sides of the two pairs having the lowest insulation resistance between them can be used.

PRECAUTIONS

Before a breakdown test is made, the pair or pairs involved shall be isolated from the central office equipment either by removing the cross-connections at a cross-connecting terminal or by removing the heat coils at the central office. In the latter case, the protector blocks of the test pair or pairs should be replaced with a B Warning Marker to warn central office personnel that breakdown tests are in progress. Warning markers should not be removed, nor should the pair or pairs be restored to normal until the tests are completed. The subscriber or subscribers on the pair or pairs under test should be notified before service is interrupted.

The following precautions should be taken at all terminal appearances of the pair or pairs under tests:

(1) Disconnect all stations and remove the protectors associated with the pair or pairs on which the breakdown test is to be made. Do not go across a test pair or pairs without first making a listening test, using a condenser in series with the talking set. This will prevent disturbing a working circuit in case the test pair is incorrectly marked in a terminal.

(2) Disconnect all dead loops or other wires associated with the pair or pairs.

(3) Rearrange any wires that are in contact with the binding posts of the pair or pairs under test.

(4) Determine whether the pair or pairs terminate in a flexible insulated form.

(5) Depending on the nature of the termination, at each appearance cover the tip and ring terminals of the pair or pairs and also any fuse mountings with a B Binding Post Cap or with a No. 1, No. 2 or No. 3 Binding Post Insulator. Then tie a linen tag on which is written 'Breakdown Test,' together with the date, on one of the caps or insulators at each appearance, except at the location where the breakdown voltage is applied. It is important that the tag and the string be so placed that they are not in contact with any binding posts in the terminals as a high resistnce fault might result due to dampness at some later date.

If the pair or pairs terminate in a textile form (including the central office form) and if a pair analysis has not definitely eliminated the possibility that the fault may be in the form, make the breakdown test from this point, or station a workman there to observe for evidence or breakdown. If the breakdown test is made at the form and there is no evidence of breakdown in the form, the set can then be applied at a distribution terminal without stationing a workman at the textile form.

The workman making the test shall call the test desk to determine whether any other men are working in the cable (at locations other than terminals) in the section to which the breakdown voltage will be applied. These men should be advised to suspend work locations. The breakdown voltage shall not be applied to any cable in which there are temporary openings unless the openings are tightly wrapped. At underground locations the workman should be advised to stay out of the manhole while the test is under way.

The 630V switches should be in the OFF position and the OHMS switch should be in the OHMS position except when the high voltage is being applied.

On completion of the breakdown test it is customary for the workman to notify test desk or cable locating bureau who will notify any men working in the cable that the tests have been completed.

TESTING PROCEDURE

If the test set is operated from the ground, it should be placed in a car or truck. If this is impractical, place the set on a rubber blanket or B Splice Covering on the ground. If the Control Unit is carried to the top of the pole and breakdown is performed from this position the Battery Pack should be hung on a pole strap at the base of the pole.

With the protectors removed and the conductors dressed away from the pair under test, connect the test clips of the Test Set Line Cord to the pair or sides of the pairs under test and then insert the plug into the line receptacle on the breakdown set. Then measure the resistance of the fault by placing the LINE SHORT switch to ±, the OHMS switch on OHMS and AMPS switch on Rx1 or Rx1K.

At pole mounted terminals clear pair under test by removing drop wires, and bridle wire to protectors.

If the resistance of the fault is less than 5000 ohms, tone can be placed on the line and traced without breaking down the pair. Tone is placed on the line as follows; place the LINE SHORT switch to ± and the OHMS switch on TONE. An audible tone is heard. *NOTE: This audible tone is only an indication that the tone components of the test set are operating properly.* It does not mean that the tone is on the line. Line tone must be verified by means of the exploring coil and amplifier. Set the voltage selector to 22.5V and check for line tone. If line tone is verified the fault can be traced. The voltage selector should always be set on the lowest voltage setting. This will minimize interference on adjacent circuits and will reduce the likelihood of the tone carrying beyond the fault.

If the pair or pairs must be broken down use the following procedure:

1. Connect the Battery Pack or the model 98 Power Supply to the Control Unit through the EXT. BAT INPUT connector and throw the power selector switch to the appropriate input.

2. Set the cut-off switch to 630V, the OHMS switch to 630V and the LINE SHORT switch to ±. The circuits are now set up for applying breakdown voltage.

3. Voltage is applied to the line by momentarily depressing the red push-button breakdown switch.

CAUTION: Breakdown voltage should only be applied by the red push-button breakdown switch. *Do not operate* any other switch while the red push-button is depressed, or damage to the set may result. If necessary to change switch position, the red push-button must be released first.

4. Release the red push-button breakdown switch and change the LINE SHORT switch to the opposite ∓ position, changing the polarity of the breakdown voltage and again momentarily depress the breakdown push-button.

5. The breakdown voltage should be applied to the line in ½ second bursts. Longer application of the breakdown voltage usually tends to clear the fault and will reduce the effective life of the batteries.

Continue applying breakdown voltage in this manner throughout the test. *AGAIN DO NOT* change the position of the LINE SHORT switch while the red breakdown push-button is depressed.

When the fault breaks down, a current will flow through the fault and the meter will show a steady reading of 1 ampere or more! When this occurs, immediately release the breakdown push-button and place the OHMS switch to TONE. Leave the LINE SHORT switch in either the ± or ∓ position.

Verify if tone is on the line, if not keep applying breakdown voltage to the line in ½ second bursts. If the fault does not break down after about 25 applications of the high voltage, adjust the 'O' position of the ohmmeter with the AMPS key in the R x 1000 position and then check the resistance of the fault to determine whether it has increased or decreased. If the fault resistance has decreased, resume operations on the same pair. If it has increased, transfer operations to another pair after the necessary precautions have been taken.

If operations on the second pair are not successful try a third pair.

Sometimes the fault can be broken down by applying the voltage from another terminal.

If the fault can not be broken down by applying 630-volt potential between the wires of a pair, apply the breakdown potential between the sides of two pairs having the lowest insulation resistance, after the necessary precautions on the two pairs have been taken. If operations on these wires are not successful try the other wires of these pairs or other pairs.

As soon as the trouble breaks down, as indicated by having tone on the line, check the resistance of the wires. To do this adjust the 'O' position of the ohmmeter with the AMPS key in the R x 1 position and then measure the resistance of the fault.

The approximate distance to the fault can then be calculated by multiplying its resistance (in ohms) by the feet-per-ohm value of the conductors and dividing by two.

Gauge of Cable	Approx. Loop Feet per Ohm
19	60
22	30
24	20
26	12

With the tone on the line, the exact location of the fault can be determined by the exploring coil method. Keep the voltage selector switch on the lowest possible setting and still maintain tone. Disconnect the Control Unit from the Battery Pack and suspend the control unit from a pole step by means of the nylon strap.

After the fault has been located, turn the switches to their normal position and disconnect the set.

Any circuits working on the pair or pairs should be restored to service. The B Binding Post Caps and the tags should be removed at the working appearances.

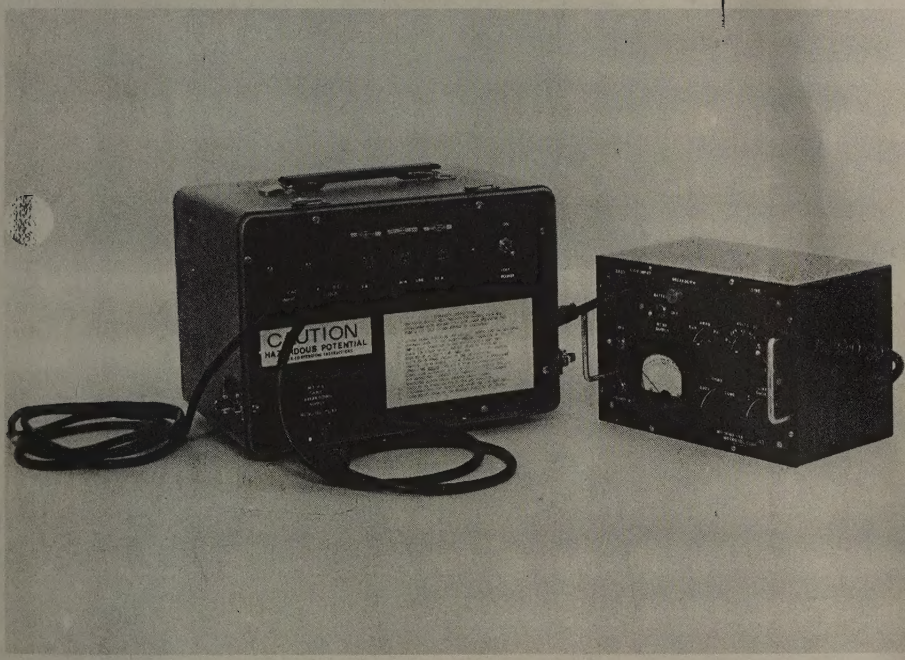
WARNING

BEFORE USING SET ON A CABLE PAIR BE CERTAIN THAT THE PAIR IS ISOLATED AT CENTRAL OFFICE AND AT TERMINALS. BE CERTAIN OTHER MEN ARE NOT WORKING ON CABLE. APPLY HIGH VOLTAGE ONLY BETWEEN WIRES OF PAIR, NEVER TO GROUND OR BETWEEN DIFFERENT WIRES OF DIFFERENT PAIRS. ALWAYS HAVE "630V" SWITCH IN "OFF" POSITION EXCEPT WHEN ACTUALLY APPLYING HIGH VOLTAGE.

Wire Resistance Table

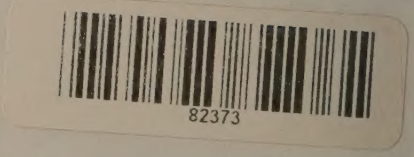
At 68° F

Gauge	Approx. Feet Per Ohm	Approx. Ohms Per 1000 Feet
19	125	8
22	62	16
24	40	26
26	25	42



MT-14103-L5B Test Set
with optional MT-98 A.C. Power Supply

MetroTel Corp



15 Burke Lane
Syosset, N.Y. 11791
(516) 364-3377